WBSC

WORLD
BASEBALL SOFTBALL
CONFEDERATION

Game Time!

HYDRATION PROTOCOL

WBSC
WORLD
BASEBALL SOFTBALL
CONFEDERATION
Game Time!

HYDRATION PROTOCOL

INDEX

INTRODUCTION

Maintaining optimal hydration is fundamental for safeguarding health and enhancing physical and athletic performance. Proper fluid balance before, during, and after exercise is of paramount importance. Nutrition experts (including doctors, biologists, and dietitians with specialised training) and sports professionals (coaches, technical staff, athletic trainers, physical instructors, and managers) play a key role in helping athletes ensure their well-being and achieve their full athletic potential.

DEHYDRATION

During physical activity, the human body generates heat and loses fluids primarily through sweating and respiration. This fluid loss can lead to a reduction in plasma volume and electrolyte concentration in the blood, which can impair the functioning of the heart, muscles, and nervous system. Research has demonstrated that even a modest fluid loss of around 2% of body weight can negatively affect athletic performance.

Dehydration can impact several physiological functions, including heart rate, blood pressure, and thermoregulation, thereby reducing an athlete's capacity for sustained performance and increasing the risk of early fatigue and muscle injuries. Additionally, dehydration can impair central nervous system function, affecting cognitive abilities, attention, concentration, and decision-making—essential qualities for athletes in sports such as baseball and softball.

The environmental conditions (temperature, humidity, sun exposure, and wind) during training or competition can significantly affect fluid losses. Vigorous exercise, especially in hot conditions, can lead to substantial increases in body temperature. To dissipate this heat, the body increases sweating and blood flow to the skin. However, when dehydration sets in, the body's ability to sweat and regulate its temperature diminishes, heightening the risk of overheating and heat-related illnesses.

Sweat contains not only water but also electrolytes such as sodium, potassium, and magnesium, which must be replenished to prevent imbalances that can hinder performance and health. The rate of sweat production varies significantly between individuals due to factors such as body composition, genetic predisposition, acclimatisation, and environmental conditions.

Dehydration Due to Sun Exposure

Prolonged exposure to the sun, particularly during the hottest hours of the day, significantly increases the risk of dehydration—especially during outdoor physical activity. Direct solar heat raises the body's core temperature, triggering increased sweating as a natural cooling mechanism. However, if this fluid loss is not matched by adequate hydration and electrolyte intake, dehydration can occur rapidly.

Sun-induced dehydration can be particularly insidious, as its early symptoms—such as thirst, fatigue, dry mouth, and mild headache—are often overlooked. In hot and sunny environments, the body can lose up to 1–2 litres of sweat per hour, quickly leading to a fluid and electrolyte imbalance. If not addressed promptly, dehydration can impair thermoregulation, increase the risk of heat-related illnesses, and negatively affect both cognitive and physical performance.

It is essential for athletes, coaches, and sports personnel to recognise the early signs of dehydration and implement preventive measures. These include regular fluid intake, the use of electrolyte-containing beverages, and scheduling training sessions during cooler times of the day. Wearing breathable clothing, providing access to shaded areas, and allowing for frequent breaks are also critical steps in protecting athletes' health and performance in hot, sunny conditions.

PHASES & SYMPTOMS

Dehydration manifests in different phases depending on the severity of fluid loss. The symptoms typically correlate with the percentage of body weight lost to dehydration:

Mild Dehydration (1-2% percentage of body weight): Mild thirst, dry mouth, slight fatigue.

Moderate Dehydration (3-5% percentage of body weight): Intense thirst, very dry mouth, reduced urine output, pronounced fatigue, muscle cramps.

Severe Dehydration (>5% percentage of body weight): Extreme thirst, dry mouth and lips, minimal or no urine output, severe fatigue, dizziness, confusion, fainting, severe muscle cramps.

Dehydration occurs when the body loses more fluids than it takes in, leading to a negative fluid balance. The signs and symptoms can escalate from mild thirst and dry mouth to extreme fatigue, dizziness, and life-threatening conditions such as heatstroke or fainting.

HYDRATION STRATEGIES

To prevent dehydration and optimise performance, it is essential to adopt appropriate hydration strategies. These strategies should be tailored to the type of exercise, individual needs, and environmental conditions. Key recommendations include:

Electrolyte Supplementation

In prolonged or high-intensity exercise, particularly in hot and humid conditions, supplementation with electrolytes may be beneficial to maintain balance and prevent hyponatremia (low blood sodium levels) or overhydration. Sodium is particularly important for replenishing losses in sweat and aiding fluid retention.

Hydration with Complex Beverages

For longer-duration or more intense activities, hydration beverages containing a combination of water, electrolytes (particularly sodium and potassium), and carbohydrates can be beneficial. These help to restore electrolyte balance, maintain energy levels, and prevent dehydration. The carbohydrate content in these drinks also provides a source of energy during prolonged physical exertion.

Fluid Monitoring

Athletes should closely monitor their fluid intake, especially during long or intense training sessions and competitions. Regular hydration can prevent fluid deficits and support performance. Signs of dehydration or electrolyte imbalances, such as excessive thirst, fatigue, or muscle cramps, should be promptly addressed.

Monitoring hydration status is essential to prevent dehydration and maintain optimal physical performance, particularly in hot conditions. A simple yet effective method is observing the colour of urine: a pale yellow usually indicates adequate hydration, while a darker yellow or amber hue suggests a need to increase fluid intake. Tracking body weight before and after physical activity can also provide insight—losing more than 2% of body weight through sweat is a sign of significant fluid loss and possible dehydration. Lastly, relying on thirst alone is not recommended, as it is a delayed response to fluid deficit; individuals should aim to hydrate regularly, even before feeling thirsty.

What, When, and How Much to Drink

Water remains the primary beverage for maintaining hydration, but during prolonged, intense activity, especially in hot environments, water alone may not suffice. The optimal beverage choice depends on the intensity and duration of exercise, as well as personal preferences. Water leaves the stomach relatively quickly, with absorption occurring within 5–15 minutes after consumption.

For exercise lasting more than 60 minutes, especially in hot conditions, electrolyte-containing beverages are recommended to maintain both fluid and electrolyte balance. Additionally, athletes should aim to drink 200–300 ml (approximately 7–10 oz) of fluid every 10–20 minutes during intense activity.

PRACTICAL RECOMMENDATIONS

While anyone can suffer from dehydration, certain groups are at higher risk:
- Children and elderly individuals;
- Athletes or individuals unacclimatised to heat;
- People with pre-existing medical conditions (e.g., diabetes, cardiovascular issues);
- Individuals wearing heavy or non-breathable clothing;
- Participants in prolonged outdoor activities.

Risk Groups
- Young children and older adults;
- Athletes unaccustomed to heat;
- Individuals with underlying health conditions; and
- Those wearing heavy or non-breathable clothing.

Exercise protocol

Pre-Exercise Hydration
It is advisable to begin exercise in a well-hydrated state. Athletes should aim to drink 500 ml of water or an electrolyte beverage 2–3 hours prior to exercise and 200–300 ml 20 minutes before activity.

During Exercise
During prolonged or high-intensity exercise, particularly in hot or humid conditions, athletes should aim to drink 200–300 ml of fluid every 15–20 minutes to stay hydrated. The fluid should ideally contain electrolytes (sodium, potassium, magnesium) and carbohydrates for optimal absorption and performance.

Post-Exercise Hydration
After exercise, it is crucial to restore any fluid and electrolyte losses. The goal is to drink enough fluids to replace the body's losses. Consuming a beverage that contains both water and electrolytes can help restore balance. It is also helpful to consume a recovery drink that provides carbohydrates and proteins to replenish energy stores and promote muscle recovery.

ELECTROLYTES & THEIR ROLE IN HYDRATION

Electrolytes such as sodium, potassium, magnesium, and calcium play a vital role in regulating the body's fluid balance, muscle contractions, nerve function, and overall hydration status. Maintaining the correct balance of these electrolytes is crucial for preventing cramps, fatigue, and other performance issues during physical exertion.

Sodium
The most significant electrolyte lost through sweat, sodium helps retain fluid balance and regulate blood volume. It also supports nerve function and muscle contraction.

Potassium
Essential for muscle function, nerve transmission, and maintaining fluid balance, potassium helps prevent muscle cramps and supports heart function.

Magnesium
Involved in over 300 biochemical reactions, magnesium supports muscle contraction, energy production, and protein synthesis.

Calcium
Crucial for muscle contraction, nerve function, and bone health, calcium must be replenished during high-impact or intense exercise.

CONCLUSION

Adequate hydration is essential for optimal athletic performance and health. Fluid and electrolyte needs vary between individuals and depend on factors such as exercise intensity, environmental conditions, and personal characteristics. Athletes must develop personalised hydration strategies to ensure they are properly hydrated before, during, and after exercise. By following these guidelines, athletes can maximise performance, reduce the risk of dehydration, and improve overall physical well-being.

For more tailored advice, athletes are encouraged to consult a sports dietitian or other qualified professional to ensure their hydration strategies align with their specific needs and goals.

BIBLIOGRAPHY

American College of Sports Medicine, Sawka, M. N., Burke, L. M., Eichner, E. R., Maughan, R. J., Montain, S. J., & Stachenfeld, N. S. (2007). American College of Sports Medicine position stand. Exercise and fluid replacement. *Medicine & Science in Sports & Exercise*, *39*(2), 377–390. https://doi.org/10.1249/mss.0b013e31802ca597

Armstrong, L. E., Soto, J. A., Hacker, F. T., Jr., Casa, D. J., Kavouras, S. A., & Maresh, C. M. (1998). Urinary indices during dehydration, exercise, and rehydration. *International Journal of Sport Nutrition*, *8*(4), 345–355. https://doi.org/10.1123/ijsn.8.4.345

Casa, D. J., Armstrong, L. E., Hillman, S. K., Montain, S. J., Reiff, R. V., Rich, B. S., Roberts, W. O., & Stone, J. A. (2000). National athletic trainers' association position statement: Fluid replacement for athletes. *Journal of Athletic Training*, *35*(2), 212–224. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1323420/

Maughan, R. J., Shirreffs, S. M., & Leiper, J. B. (2007). Errors in the estimation of hydration status from changes in body mass. *Journal of Sports Sciences*, *25*(7), 797–804. https://doi.org/10.1080/02640410600875143

Maughan, R. J., & Shirreffs, S. M. (2008). Development of individual hydration strategies for athletes. *International Journal of Sport Nutrition and Exercise Metabolism*, *18*(5), 457–472. https://doi.org/10.1123/ijsnem.18.5.457

Shirreffs, S. M., & Sawka, M. N. (2011). Fluid and electrolyte needs for training, competition, and recovery. *Journal of Sports Sciences*, *29*(Suppl 1), S39–S46. https://doi.org/10.1080/02640414.2011.614269